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collectione Camphoræ non niſi ex auditu commemorari, & viros cœteroquin eruditos *Ten Rheine*, *Breynium*, *Hermannum* cœteroſque, alium ex alio tranſcripſiſſe, nullum vero, quantum credere par eſt, rem oculis in arbore ipſa conſpexiſſe, quæ quidem fallacia in Hiſtoria naturali prima non foret. Hinc denique concludo, eſſe omnino hanc ſpeciem Camphoræ tam raram, ut eam oculis cernere nemini liceat, nec forſan unquam contingere queat.

C. NEUMAN.

III. *Obſervations of the* Dipping *Needle, made at* London, *in the Beginning of the Year* 1723. *By Mr.* George Graham, Watchmaker, F. R. S.

ABOUT the Time I was obſerving the Variation of the Horizontal Needle, I made likewiſe ſome Experiments with the Dipping Needle, to try, if the Dip and Vibrations were conſtant and regular. The Needle I made for this Purpoſe was 12 Inches and one Tenth long, half an Inch broad in the Middle, but not above one Tenth near the Ends; the Ends themſelves being filed to fine Edges; and in Thickneſs it was about one Third of a Tenth. The Ends of the Axis, upon which the Needle turn'd, were very ſmooth, and not bigger than was neceſſary for the Support of the Needle, which weighed nine Pennyweights twenty one Grains, or about half an Ounce *Troy*. The Ends of the Axis were placed upon the Edges of two thin Plates of Steel, that were hard and well poliſh'd, and parallel to the Horizon, that the Needle, when vibrating, might roll, and not ſlide upon the Edges of the Plates, to avoid the Friction

Friction they would have been ſubject to, by moving in Holes. A Braſs Semicircle was provided, and from the loweſt Point graduated each Way, and a few of the Degrees, about that Part of it which anſwer'd to the Dip, were divided into ſix equal Parts. By the Help of Screws, the Semicircle could be brought to a due Situation; and by two ſpirit Levels, placed at right Angles to each other, any Change of Situation was eaſily perceiv'd, and by the Screws it could be readily reſtor'd to its former Poſition; all was inclos'd with Glaſs to ſecure the Needle from being diſturb'd by the Motion of the Air. I muſt here take Notice of the great Difficulty there is of peiſing the Needle ſo exactly, before it is touch'd with the Loadſtone, as to take any Poſition indifferently: for, when it is pretty near the Truth, it is extremely troubleſome to place it at reſt in the Poſition deſir'd, in order to try which Way it is inclin'd to move. I cannot be done in the open Air; for the leaſt Motion of it will diſturb the Needle, and when it is ſhut up, it is no eaſy Matter to ſettle it in the Place intended. And that there will be a ſenſible Difference of the Dip, upon ſhifting the Sides of the Needle, whatever Pains be taken to prevent it, I am fully ſatisfied from the following Experiments.

March 20, 1722.

EXPERIMENT I.

I Touch'd both Sides of that End of the Needle which I deſign'd to point South, upon the North-pole of a ſmall *Terrella*; after which I cauſed it to vibrate in an Arch of ten Degrees, and counted the Time by a Pendulum Clock, ſhewing Seconds, till the Needle had performed 50 Vibrations.

It perform'd the firſt 25 Vibrations in			2′	58″
The next 25 Vibrations in			2	27
The 50 in			5	25
Which gives for each Vibration at a Medium				6, 5
The Needle dipp'd	73°	15′		

EXPERIMENT II.

Then I ſhifted the Needle ſo as that Side, which before reſpected the Eaſt, was now turn'd Weſt, and cauſing it to vibrate in the ſame Arch, as before, it perform'd

			2′	49″
The firſt 25 Vibrations in			2	39
The next 25 in			5	28
The 50 Vibrations in				6, 56
That is, each Vibration in				
The Dip	73°	50′		

EXPERIMENT III.

I now touch'd the ſame End of the Needle, a ſecond Time, on both Sides, upon the ſame Stone, and ſuffering it to vibrate, as before,

It perform'd 25 Vibrations in			2′	49″
That is, one Vibration in				6, 76
The Dip	73°	20′		

EXPE-

EXPERIMENT IV.

The Needle was now ſhifted, and ſtood as in the ſecond Experiment.

It perform'd 25 Vibrations in		2′	41″
That is, one Vibration in			6, 44
Dip	73°	45′	

EXPERIMENT V.

The ſame End of the Needle being now touch'd twice on each Side, with the Loadſtone preſented by Right Honourable the Lord *Paiſley* to the Royal Society, in the Armour,

			′	″
It perform'd the firſt 25 Vibrations in			1	58
The next 25 in			1	46
The 50 Vibrations in			3	44
That is, each Vibration in				4, 48
The Dip	73°	55′		

EXPERIMENT VI.

The Needle being turn'd, and ſtanding as in the ſecond and fourth Experiments, it perform'd

			′	″
The firſt 25 Vibrations in			2	00
The next 25 in			1	57
The 50 Vibrations in			3	57
That is, each Vibration in				4, 74
The Dip	74°	10′		

EXPE-

EXPERIMENT VII.

I now touch'd the Needle at both Ends with the ſame Stone, with which it was touch'd in the fifth Experiment, after which it perform'd

			′	″
The firſt 25 Vibrations in			1	35
The next 25 in			1	34
The 50 in			3	9
That is, each Vibration in				3, 78
The Dip	74	20		
The Dip repeated with the Needle taken off and replaced	74	20+		

EXPERIMENT VIII.

Upon ſhifting the Needle, it perform'd

			′	″
The firſt 25 Vibrations in			1	33
The next 25 in			1	34
The 50 in			3	7
The Dip	74°	25′		
The Dip repeated	74	30—		

NB. *The Needle had the ſame Side to the Eaſt in the firſt, third, fifth, and ſeventh Experiments; and had that Side turn'd Weſtward in the ſecond, fourth, ſixth, and eighth; and I began to count the Vibrations, when I obſerv'd it to vibrate juſt* 10 *Degrees, as near as I could gueſs. All theſe Experiments were made with ſufficient Care in every Particular, excepting the Quantity of the Dip, which requires the Diviſions of the Semicircle to be very*

equal

equal, and the 90th Degree to be perpendicularly under the Axis of the Needle; this laſt I found was a little faulty, the Dip being in Reality greater than the Semicircle ſhewed it. After I had rectified this Error, and new touch'd the Needle, upon that Part of the Armour to which Iron is applied, when it is to be lifted by the Stone, it perform'd the ſame Number of Vibrations in leſs Time than in any of the former Trials. I now determin'd to obſerve, for ſome Space of Time, both the Dip and Vibrations, without freſh touching the Needle.

The Obſervations follow, by which it appears there is a very conſiderable Difference, both in the Quantity of the Dip, and in the Quickneſs of the Vibrations.

N.B. *In all theſe Experiments, the Needle was placed, ſo as to vibrate exactly in the Plane of the Magnetick Meridian; and ſufficiently diſtant from all Iron that could affect it, as far as I could perceive, till I had Occaſion to put up a very large Iron Rod in the Room above it, which immediately alter'd the Dip of the Needle, and thereby put an End to theſe Trials.*

1723.	Dip ° ′	Time of the Day. h ′
Mar. 29.	75=00 at	10=00.
	74=53	4=15
30.	74=55+	1=00
	74=50—	4=00
31.	74=50—	10=00
	74=50—	12=30
	74=50—	2=15
April 1.	74=25	6=45
	74=25—	7=15
	74=20+	9=00
2.	74=20+	7=30. A.M.
	74=20+	7=30. P.M.
3.	74=20+	9=30
	74=20+	12=30
	74=50	4=15
4.	74=55+	10=00
	74=50+	11=15
	74=40	12=45
	74=35	7=30
5	74=40	9=15
	74=40	1=45
	74=40+	5=30
	74=30+	8=15
6.	74=35	10=00
	74=35	12=00
7.	74=35+	10=20
	74=35+	12=30
	74=35	4=00
	74=35	6=30
8.	74=40—	12=15
	74=40—	3=30
9.	74=40—	10=00
	74=40—	4=15
10.	74=40—	10=00
	74—30+	8=00

	Dip ° ′	Time of the Day. h ′
Apr. 11.	74=35+	10=00. A.M.
13.	74=40—	
14.	74=40—	10=45
	74 40—	11=15
	74=35	5=10
	74=35	8—17
15.	74=35	9=10. A.M.
16.	74=35	11=00
	74=30+	8=45
17.	74=45	12=25
18.	74=40+	9=15
	74=45	5=00
19.	74=45	9=00. A.M.
20.	74=45	
21.	74=50	10=30
23.	74=50	12=00
26.	74=50+	2=30
27.	74=55	
28.	75=00	1=00. P.M.
	75=00	3=15
	74=58	5=15
30.	74=40	3=15
May 1.	74=45	1=30
2.	74=45	12=00
	74=45+	1=00
	74=40+	3=50

The Weight of the dipping Needle 9pt. 21gr. *Troy.*

N.B. The Mark + ſignifies ſomething more than is here ſet down, and — ſignifies ſomething leſs, but the Difference could ſcarce amount to more than two Minutes.

Experi-

Experiments of the Vibrations of the Dipping Needle, beginning with an Arch of 10 Degrees, with the Times in which 100 Vibrations were perform'd,

1723 h '
April 1. about 7=15 Afternoon.

' "
First 50 in 3= 2
Last 50 in 2=45

The 100 in 5=47. Dip 74°=25'—

April 2. in the Evening
First 50 in 3= 3
Last 50 in 2=43

The 100 in 5=46. Dip 74=20+

April 3. about 4 in the Afternoon.
First 50 in 2=52
Last 50 in 2=39

The 100 in 5=31. Dip 74=50

Repeated about an Hour after.
First 50 in 2=53
Last 50 in 2=35

The 100 in 5=28. Dip 74=50+

April 4. about 11=15 in the Morn.
First 50 in 2=54
Last 50 in 2=30

The 100 in 5=24. Dip 74=50+

April 28. about 5=15 Afternoon.
First 50 in 2=48
Last 50 in 2=16

The 100 in 5= 4. Dip 74=58

Repeated
First 50 in 2=47
Last 50 in 2=16

The 100 in 5= 3. Dip 74=58

May 20. ' "
First 50 in 3=11
Last 50 in 3= 1

The 100 in 6=12

Repeated the Needle being new touch'd.
First 50 in 2=38
Last 50 in 2=23

The 100 in 5= 1. Dip 74=35

Repeated again about an Hour after
First 50 in 2=38
Last 50 in 2=20

The 100 in 4=58. Dip 74=30+

May 21. about Noon
First 50 in 2=41
Last 50 in 2=28

The 100 in 5= 9. Dip 74=30

May 23. about 12=45
First 50 in 2=40
Last 50 in 2=27

The 100 in 5= 7. Dip 74=40

May 25. about 3=30
First 50 in 2=41
Last 50 in 2=30

The 100 in 5=11. Dip 74=40+

May 27. about 6=30 Afternoon.
First 50 in 2=41
Last 50 in 2=28

The 100 in 5= 9. Dip 74=50